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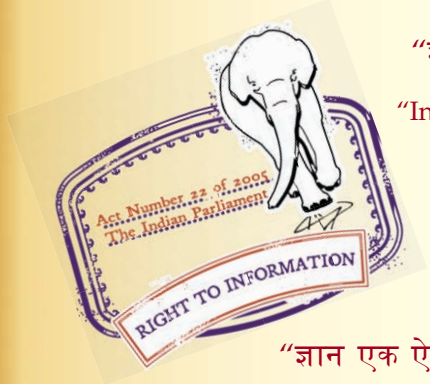
IS 11901 (1986): Titanium Sponge [MTD 7: Light Metals and their Alloys]



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"Knowledge is such a treasure which cannot be stolen"

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IS : 11901 - 1986
(Reaffirmed 1997)

Indian Standard

SPECIFICATION FOR TITANIUM SPONGE

UDC 669·25—405·8

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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August 1987

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SPECIFICATION FOR TITANIUM SPONGE

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Indian Standard

SPECIFICATION FOR TITANIUM SPONGE

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 15 October 1986, after the draft finalized by the Special Alloys Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 Titanium and its alloys possess high specific strength and excellent corrosion resistance and are being increasingly used in many chemical, aerospace and other industrial applications.

0.3 Titanium sponge, which is produced by reduction of titanium tetrachloride by magnesium or sodium, is the starting melting stock. Control of impurity levels is essential to obtain ingots of titanium and titanium alloys of acceptable grade.

0.4 This standard has been prepared as a guide for the consumers who use titanium sponge for melting of titanium and its alloys.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS: 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This specification covers virgin titanium metal melting stock. This virgin metal is commonly designated as titanium sponge because of its porous sponge like appearance.

2. MANUFACTURE AND SUPPLY

2.1 Sponge titanium is usually prepared by reduction of titanium tetrachloride and its sponge like character is the result of the production process. This spongy characteristic, however, is not considered essential and may vary with the production process. The metal is usually supplied in lumps of 2-25 mm in size.

2.2 Only virgin titanium, free of scrap and free of intentionally added contaminants shall be supplied under this specification. It shall be supplied, in uniform, well mixed blends, each of which shall be clearly designated.

*Rules for rounding off numerical values (*revised*).

3. CHEMICAL REQUIREMENTS

3.1 The titanium metal shall conform to the chemical composition requirements given in Table 1.

TABLE 1 CHEMICAL AND HARDNESS REQUIREMENTS

Elements	Weight, Percent (Dry Basis)					
	MD 100	MD 120	ML 120	SL 100	SL 120	GP120
Nitrogen (Maximum)	0·01	0·015	0·015	0·01	0·015	0·020
Carbon (Maximum)	0·01	0·020	0·025	0·015	0·020	0·025
Sodium (Maximum) (Total)	—	—	—	0·01	0·19	a*
Magnesium (Maximum)	0·04	0·080	0·500	—	—	a*
Chlorine (Maximum)	0·08	0·120	0·200	0·1	0·20	0·20
Iron	0·05	0·120	0·150	0·03	0·05	0·25
Silicon (Maximum)	0·02	0·040	0·040	0·02	0·04	0·04
Hydrogen (Maximum)	0·003	0·010	0·030	0·05	0·05	0·03
Oxygen (Maximum)	0·06	0·100	0·100	0·08	0·10	0·15
All other impurities (Total) (Maximum)	0·05	0·050	0·050	0·05	0·05	0·05
Titanium balance (Nominal)	99·5	99·30	99·1	99·5	99·3	—
Hardness (HB) (Maximum)	100	120	120	100	120	120

MD — Megnesium reduced and distilled,

ML — Magnesium reduced and leached,

SL — Sodium reduced and leached.

GP — General purpose either magnesium or sodium reduced and finished by or inert gas sweep or bath.

a* — Sodium or magnesium *Max* 0·50 percent.

4. METHODS OF CHEMICAL ANALYSIS

4.1 An analysis shall be made on a sample prepared in accordance with one of the two methods presented in Appendix A or as agreed upon by the manufacturer and the purchaser. The methods of analysis shall be a matter of agreement between the manufacturer and the purchaser.

5. REPORT OF ANALYSIS

5.1 The manufacturer shall supply at least one copy of his report showing the results of chemical analysis and hardness test on the material supplied.

6. SAMPLING

6.1 The sampling methods used shall be a matter of agreement between the manufacturer and the purchaser. However, two methods are given in Appendix A for guidance only.

7. HARDNESS

7.1 The method of measurement shall be in accordance with IS : 1500-1983*, using a 10 mm ball, 1 500 kg load and 30 ± 2 seconds dwell.

8. REJECTION

8.1 Materials not conforming to specification or to authorised modifications shall be subject to rejection. Method of disposal of rejected material will be agreed upon by the manufacturer and the purchaser.

9. REFEREE TEST AND ANALYSIS

9.1 If requested by the manufacturer, duplicate samples from the requested material may be supplied to a referee for check testing or analysis.

10. PACKING

10.1 The method of packaging shall be agreed upon by the manufacturer and the purchaser. The size and nature of the containers used are generally determined by the time and length of storage and the amount of handling involved. Where a fire hazard or sponge deterioration during prolonged storage are primary considerations, titanium sponge should be packed in air tight, moisture proof, argon filled sealed metal cans or drums of a type suitable for shipment at the lowest rate by common carrier. Tightly sealed fibre drums are considered adequate where handling is at a minimum and usage is rather prompt.

11. MARKING

11.1 Each container shall be marked with the following particulars:

a) Manufacturer's name or trade-mark,

b) Year and month of manufacture, and

c) Lot number.

*Method for Brinell hardness test for metallic materials.

11.1.1 The material may also be marked with the Standard Mark.

NOTE — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act 1986 and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard, under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

APPENDIX A

(*Clause* 6.1)

METHODS FOR SAMPLING

A-1. METHOD A

A-1.1 The sample for determining the conformance of the lot to the physical and chemical requirements shall be obtained by sampling to produce a 0·5 percent sample. For material packed in drums of about 250 kg each, the sample is collected by taking 1·25 kg from each drum in five equal instalments of 250 kg each while filling the drums. The quantity to be taken in each instalment, however, can be reduced proportionately if drum size is smaller than 250 kg. This blended evaluation sample is reduced number of times by a Riffle Sampler or by any other suitable sampling device to give samples of 800 g each. Two such samples are compacted into cylinders of approximately 70 mm dia at a pressure of 2 500 kg/cm^2 or more. Compacts are then drilled with a clean drill to get turnings weighing at least half of the original weight. The mixture of turnings from both the compacts is sent for analysis of magnesium, sodium and chlorine. A third 800 g sample is dried at 100 $\pm$ 5°C for one hour in an electrical oven. The sample is then divided into 8 samples to be melted into buttons of 50 g or more each. The buttons are melted in a furnace by electrode arc melting with tungsten electrode under argon atmosphere. The resulting buttons are machined to get parallel top and bottom surfaces. The Brinell hardness is determined at two points on each surface. No hardness determination is done on the button melted first since it is likely to be contaminated by gaseous impurities present in the furnace and hence becomes harder. Average hardness value as determined by this procedure shall be reported. The samples are taken from each button for analysis of hydrogen, oxygen, nitrogen and other elements like iron, silicon molybdenum, carbon, etc. A fourth 800 g sample is melted to 8 buttons of 50 g or more each as above and these 8 buttons shall accompany the shipment.

A-2 METHOD B

A-2.2. The sample for determining the conformance of the lot to the chemical and physical requirements shall be obtained by sampling to produce a 0·50 percent sample. For material packed in drums of about 250 kg each, the sample is collected by taking 1·25 kg from each drum in 5 equal instalments of 250 g each while filling the drums. The quantity to be taken in each instalment however, can be reduced proportionately if drum size is smaller than 250 kg. This blended evaluation sample is compacted into one or more consumable electrodes for melting. A portion of the compact or compacts is sawed off prior to melting and sampled by drilling to produce at least 800 g of drillings. These drillings are sent for the analysis of magnesium, sodium and chlorine. If more than one electrode have been compacted these are welded to form a single consumable electrode and this electrode is melted under argon atmosphere to form an ingot. A transverse section approximately 12 mm thick from the middle of the resulting ingot is taken and both sides of this section are machined. Brinell hardness is determined at five points equal distance apart and diagonally across the machined surface. Average hardness value as determined by this method shall be reported. Five slices of 6 mm width are taken from this slab parallel to the hardness measurement locations and samples from these slices are sent for analysis of oxygen, nitrogen, hydrogen, and other elements like iron, silicon, molybdenum, carbon, etc. One half of this slab shall accompany the shipment and the other half shall be retained by the manufacturer.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Definition*
Force	newton	N	1 N = 1 kg. m/s
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2